Radio Editors of magazines and newspapers are hereby given permission to reprint in whole or in part, with proper credit to the Aerovox Corporation, the contents of this issue of the Aerovox Research Worker.

The AEROVOX Research Worker

The Aerovox Research Worker is a monthly house organ of the Aerovox Corporation. It is published to bring to the Radio Experimenter and Engineer authoritative, first hand information on condensers and resistances for radio work.

VOL. 11, NOS. 1 and 2 JANUARY - FEBRUARY, 1939 50c per year in U.S.A. 60c per year in Canada

A. R. SATULLO

USEFUL DATA
FOR THE
PRACTICAL RADIO MAN

PART II

By the Engineering Department

AEROVOX Corporation

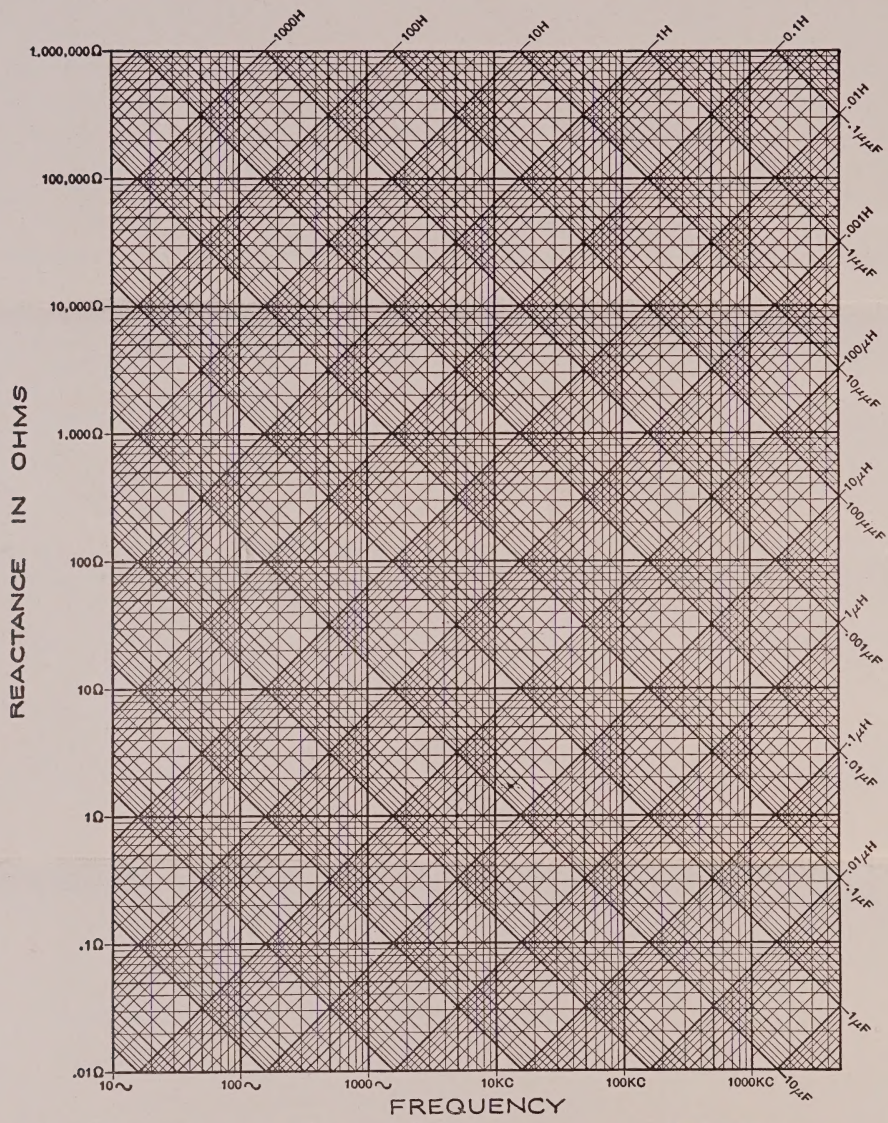
Part I of this paper was published in the combined November and December issue of the Research Worker.

AEROVOX PRODUCTS ARE BUILT BETTER

Printed in U. S. A.

Copyright 1939 by Aerovox Corporation

FREQUENCY-REACTANCE CHART



KC = kilocycles
Ω = ohms

μF = microfarads
μμF = micromicrofarads

H = henries
μH = microhenries

By courtesy Bell Laboratories Record

Figure 1

CAPACITY-EQUIVALANT SERIES RESISTANCE-POWER FACTOR

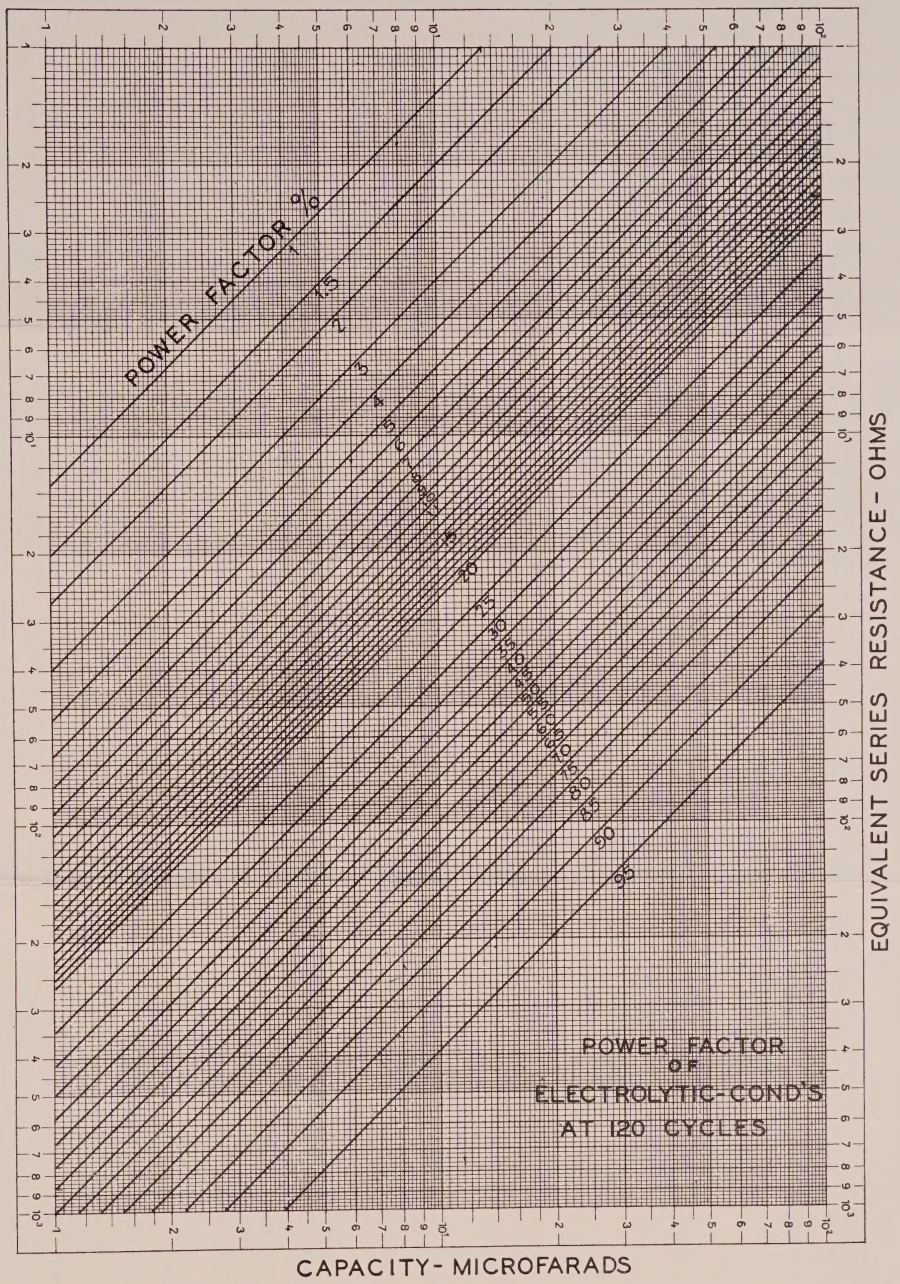


Figure 2

REACTANCE AND RESISTANCE

IN PARALLEL

When a resistance is in parallel with a reactance (either inductive or capacitive), the resultant impedance of the combination is found from the expression

$$Z = \frac{XR}{\sqrt{R^2 + X^2}}$$

Sometimes Z and R are given and X has to be found or Z and X are given and R is the unknown. In that case the equation can be solved for X and R and we have

$$X = \frac{ZR}{\sqrt{R^2 - Z^2}} \qquad R = \frac{ZX}{\sqrt{X^2 - Z^2}}$$

In all three of the above equations X can be either inductive reactance (X=6.28 fL) or it can be capacitive in which case X=1/(6.28 f C) where f is in cycles, L in henries and C in farads.

The table, Figure 3, has been prepared to permit the finding of any one of the three quantities X, R or Z when the other two are given. When X and R are given, divide the larger of the two quantities into the smaller one and thus get a ratio less than 1. Find this ratio in the left column and multiply the number obtained in the second column by R or X whichever is the larger and find Z.

Suppose R equals 1000 ohms and X is 200 ohms, which makes X/R = .20. The table shows us that Z/R is then 0.1961. Multiplying by R, we have Z = 0.1961 x 1000 = 196.1 ohms.

IN SERIES

The impedance, Z, of a combination resistance, R, and a reactance, X, in series is given by the equation

$$Z = \sqrt{R^2 + X^2}$$

When Z is given and either X or R is the unknown, this equation can be re-written:

$$R = \sqrt{Z^2 - X^2}$$

$$X = \sqrt{Z^2 - R^2}$$

In all these equations all three quantities are expressed in ohms and X can be either capacitive reactance (1/6.28 fC) or inductive reactance (6.28 fL).

The table, Figure 4, gives the value of all three quantities for the case that either X or Z is equal to 1. In other cases, find the ratio R/X or X/R refer to the table and find the corresponding ratio Z/X or Z/R. The table can also be used when Z is given together with one of the other quantities. It was for this reason that the table had to be extended for values of R/X or X/R from .1 to 10 since otherwise it would have been sufficient to include values from 1 upwards or downwards but not both. Example: suppose X = 1,600 ohms and R = 1,000 ohms. Then X/R = 1.6; the table shows Z/R = 1.8868. Then Z equals 1.8868 R or 1886.8 ohms.

Reactance and Resistance in Parallel reprinted from January 1936 Research Worker.

●

Reactance and Resistance in Series reprinted from July 1936 Research Worker.

REACTANCE AND RESISTANCE VALUES IN PARALLEL

X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X
0.10	0.0995	0.49	0.4400	0.88	0.6606
0.11	0.1093	0.50	0.4472	0.89	0.6648
0.12	0.1191	0.51	0.4543	0.90	0.6690
0.13	0.1289	0.52	0.4613	0.91	0.6730
0.14	0.1386	0.53	0.4683	0.92	0.6771
0.15	0.1483	0.54	0.4751	0.93	0.6810
0.16	0.1580	0.55	0.4819	0.94	0.6849
0.17	0.1676	0.56	0.4886	0.95	0.6888
0.18	0.1771	0.57	0.4952	0.96	0.6925
0.19	0.1867	0.58	0.5017	0.97	0.6963
0.20	0.1961	0.59	0.5082	0.98	0.6999
0.21	0.2055	0.60	0.5145	0.99	0.7036
0.22	0.2149	0.61	0.5208	1.00	0.7071
0.23	0.2242	0.62	0.5269	1.10	0.7400
0.24	0.2334	0.63	0.5330	1.20	0.7682
0.25	0.2425	0.64	0.5390	1.30	0.7926
0.26	0.2516	0.65	0.5450	1.40	0.8137
0.27	0.2607	0.66	0.5508	1.50	0.8320
0.28	0.2696	0.67	0.5566	1.60	0.8480
0.29	0.2785	0.68	0.5623	1.70	0.8619
0.30	0.2874	0.69	0.5679	1.80	0.8742
0.31	0.2961	0.70	0.5735	1.90	0.8850
0.32	0.3048	0.71	0.5789	2.00	0.8944
0.33	0.3134	0.72	0.5843	2.20	0.9104
0.34	0.3219	0.73	0.5895	2.40	0.9231
0.35	0.3304	0.74	0.5948	2.60	0.9333
0.36	0.3387	0.75	0.6000	2.80	0.9418
0.37	0.3470	0.76	0.6051	3.00	0.9487
0.38	0.3552	0.77	0.6101	3.20	0.9545
0.39	0.3634	0.78	0.6150	3.40	0.9594
0.40	0.3714	0.79	0.6199	3.60	0.9635
0.41	0.3793	0.80	0.6246	3.80	0.9671
0.42	0.3872	0.81	0.6289	4.00	0.9702
0.43	0.3950	0.82	0.6341	5.00	0.9807
0.44	0.4027	0.83	0.6387	6.00	0.9864
0.45	0.4103	0.84	0.6432	7.00	0.9902
0.46	0.4179	0.85	0.6477	8.00	0.9921
0.47	0.4254	0.86	0.6520	9.00	0.9939
0.48	0.4327	0.87	0.6564	10.00	0.9950

Figure 3

REACTANCE AND RESISTANCE VALUES IN SERIES

X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X
0.10	1.0050	0.70	1.2207	4.1	4.2202
0.11	1.0060	0.71	1.2264	4.2	4.3174
0.12	1.0072	0.72	1.2322	4.3	4.4147
0.13	1.0084	0.73	1.2381	4.4	4.5122
0.14	1.0097	0.74	1.2440	4.5	4.6098
0.15	1.0112	0.75	1.2500	4.6	4.7074
0.16	1.0127	0.76	1.2560	4.7	4.8052
0.17	1.0144	0.77	1.2621	4.8	4.9030
0.18	1.0161	0.78	1.2682	4.9	5.0009
0.19	1.0179	0.79	1.2744	5.0	5.0990
0.20	1.0198	0.80	1.2806	5.1	5.1971
0.21	1.0218	0.81	1.2869	5.2	5.2952
0.22	1.0239	0.82	1.2932	5.3	5.3935
0.23	1.0261	0.83	1.2996	5.4	5.4918
0.24	1.0284	0.84	1.3060	5.5	5.5901
0.25	1.0308	0.85	1.3125	5.6	5.6885
0.26	1.0333	0.86	1.3190	5.7	5.7871
0.27	1.0358	0.87	1.3255	5.8	5.8856
0.28	1.0384	0.88	1.3321	5.9	5.9841
0.29	1.0412	0.89	1.3387	6.0	6.0828
0.30	1.0440	0.90	1.3454	6.1	6.1814
0.31	1.0469	0.91	1.3521	6.2	6.2801
0.32	1.0499	0.92	1.3588	6.3	6.3789
0.33	1.0530	0.93	1.3656	6.4	6.4777
0.34	1.0562	0.94	1.3724	6.5	6.5764
0.35	1.0595	0.95	1.3793	6.6	6.6752
0.36	1.0628	0.96	1.3862	6.7	6.7741
0.37	1.0662	0.97	1.3932	6.8	6.8731
0.38	1.0698	0.98	1.4001	6.9	6.9720
0.39	1.0733	0.99	1.4071	7.0	7.0711
0.40	1.0770	1.00	1.4141	7.1	7.1701
0.41	1.0808	1.1	1.4866	7.2	7.2691
0.42	1.0846	1.2	1.5621	7.3	7.3681
0.43	1.0885	1.3	1.6401	7.4	7.4671
0.44	1.0925	1.4	1.7205	7.5	7.5662
0.45	1.0966	1.5	1.8028	7.6	7.6654
0.46	1.1007	1.6	1.8868	7.7	7.7646
0.47	1.1049	1.7	1.9723	7.8	7.8638
0.48	1.1092	1.8	2.0591	7.9	7.9630
0.49	1.1136	1.9	2.1471	8.0	8.0623
0.50	1.1180	2.0	2.2361	8.1	8.1615
0.51	1.1225	2.1	2.3259	8.2	8.2608
0.52	1.1271	2.2	2.4166	8.3	8.3600
0.53	1.1318	2.3	2.5080	8.4	8.4594
0.54	1.1365	2.4	2.6000	8.5	8.5580
0.55	1.1413	2.5	2.6926	8.6	8.6576
0.56	1.1461	2.6	2.7857	8.7	8.7572
0.57	1.1510	2.7	2.8792	8.8	8.8566
0.58	1.1560	2.8	2.9732	8.9	8.9560
0.59	1.1611	2.9	3.0676	9.0	9.0554
0.60	1.1662	3.0	3.1623	9.1	9.1548
0.61	1.1714	3.1	3.2573	9.2	9.2542
0.62	1.1765	3.2	3.3526	9.3	9.3536
0.63	1.1819	3.3	3.4482	9.4	9.4530
0.64	1.1873	3.4	3.5440	9.5	9.5524
0.65	1.1927	3.5	3.6400	9.6	9.6518
0.66	1.1981	3.6	3.7362	9.7	9.7512
0.67	1.2037	3.7	3 8327	9.8	9.8507
0.68	1.2093	3.8	3.9293	9.9	9.9503
0.69	1.2149	3.9	4.0262	10.0	10.0499
		4.0	4.1231		

Figure 4

REACTANCE AND RESISTANCE IN PARALLEL

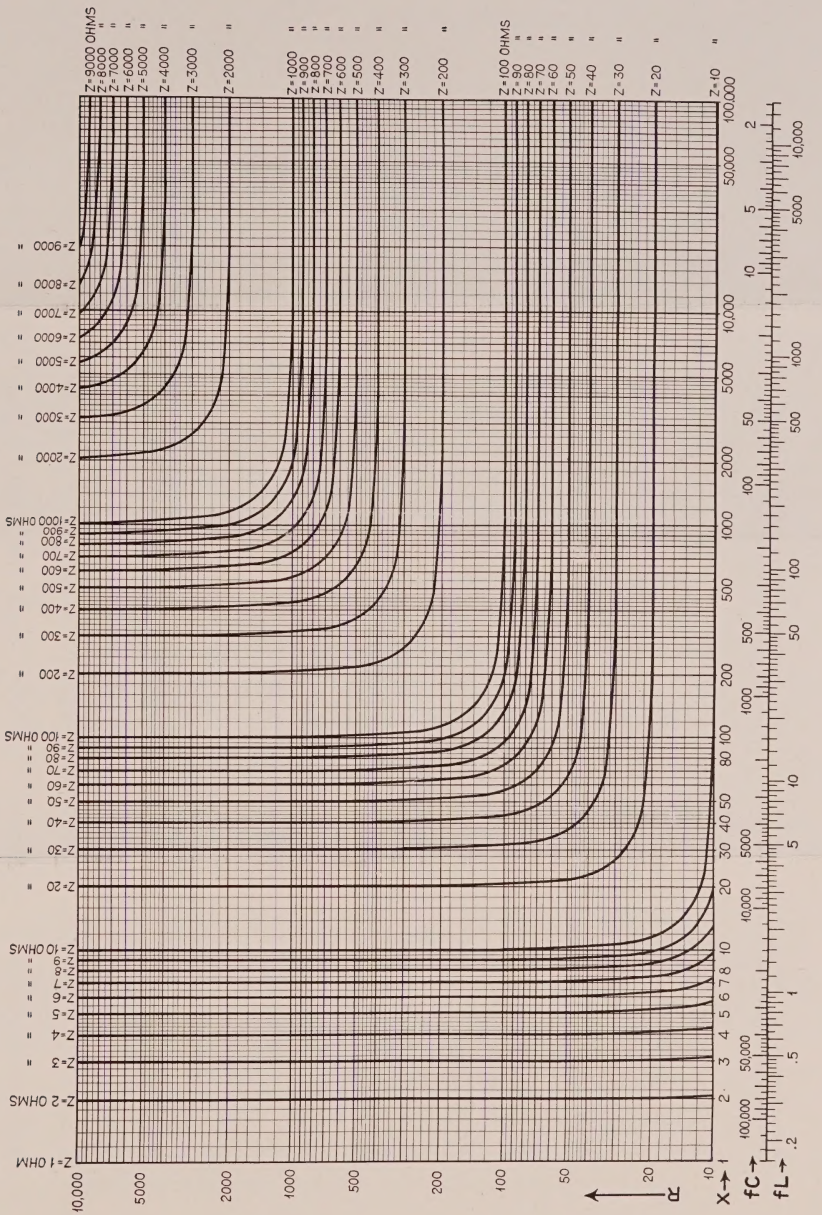


Figure 5

REACTANCE AND RESISTANCE IN SERIES

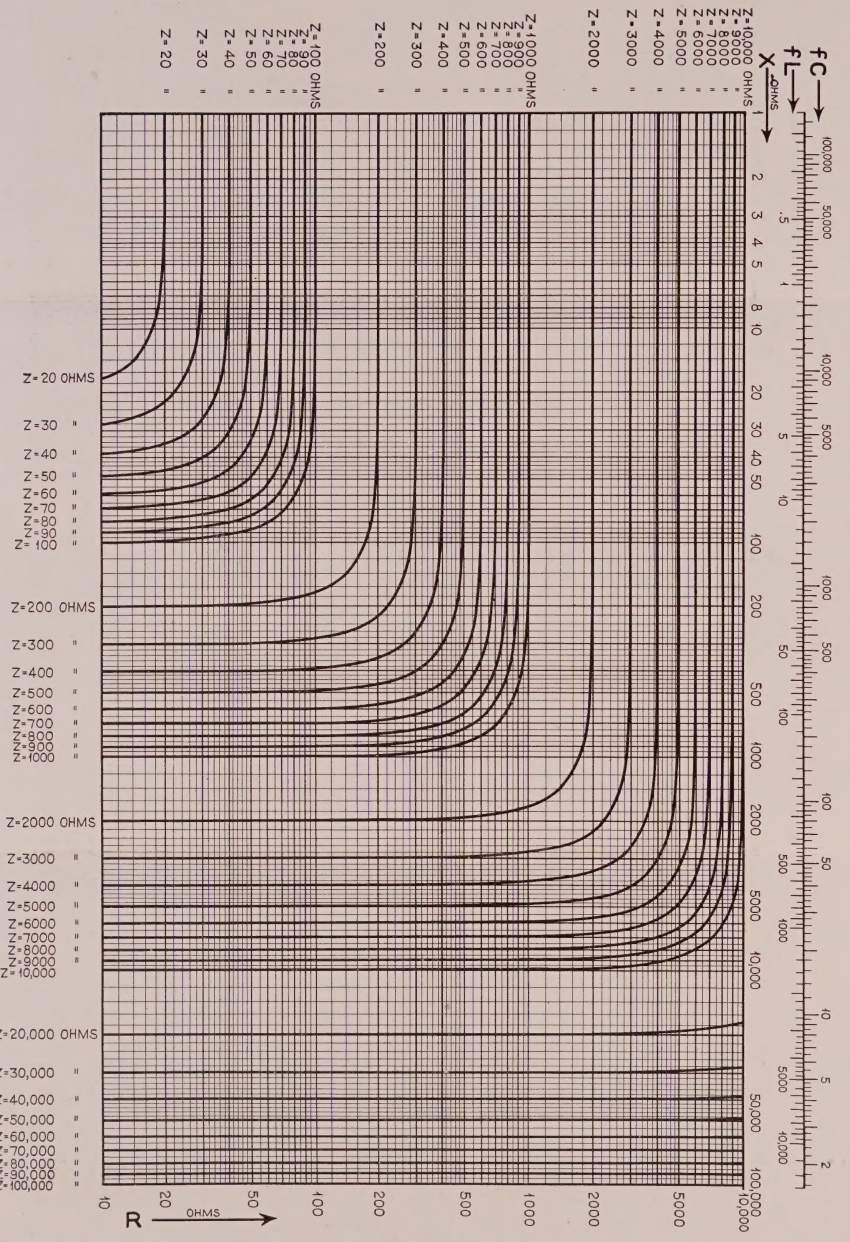


Figure 6

CURRENT, VOLTAGE AND POWER CURVE FOR RESISTANCE

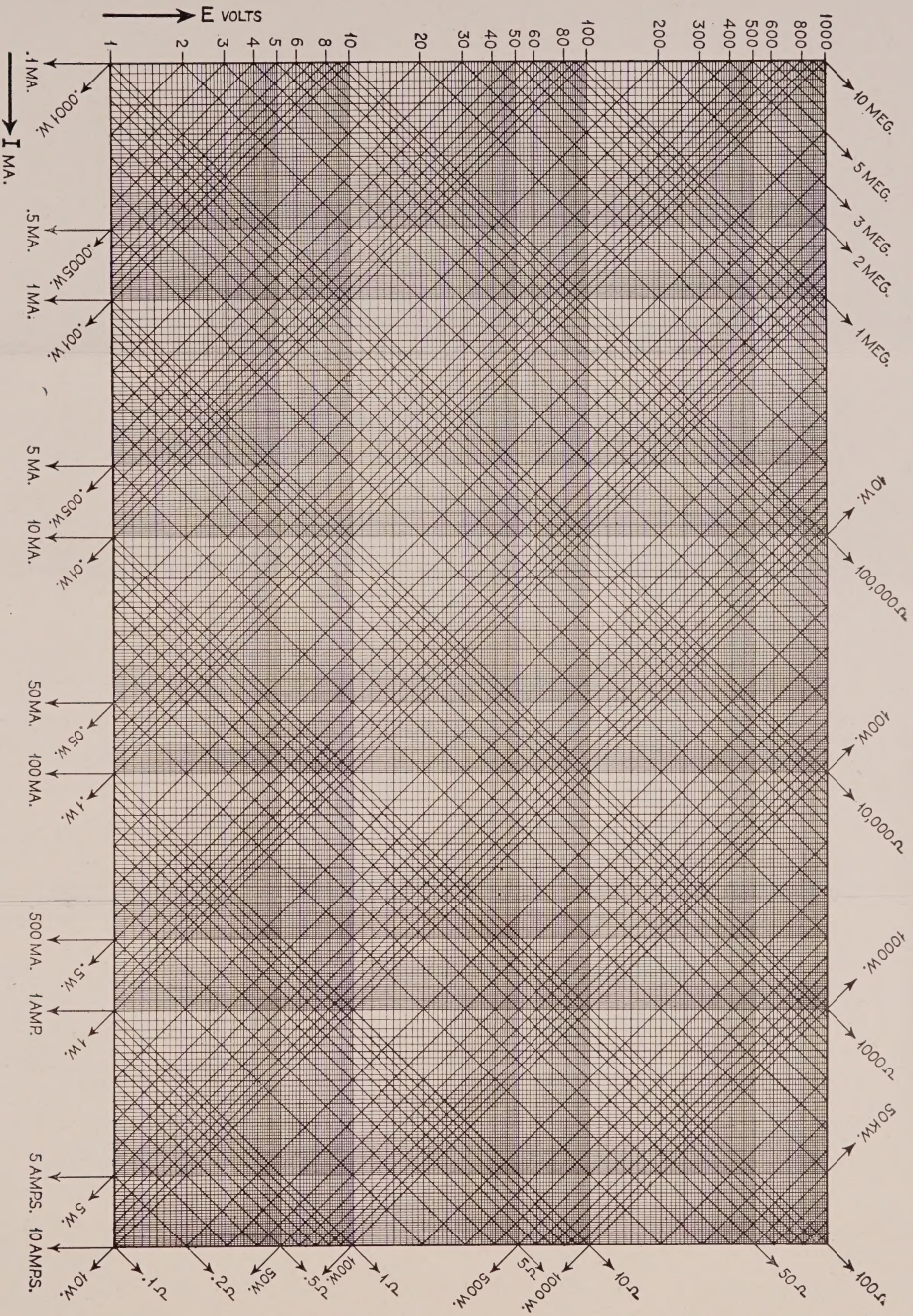
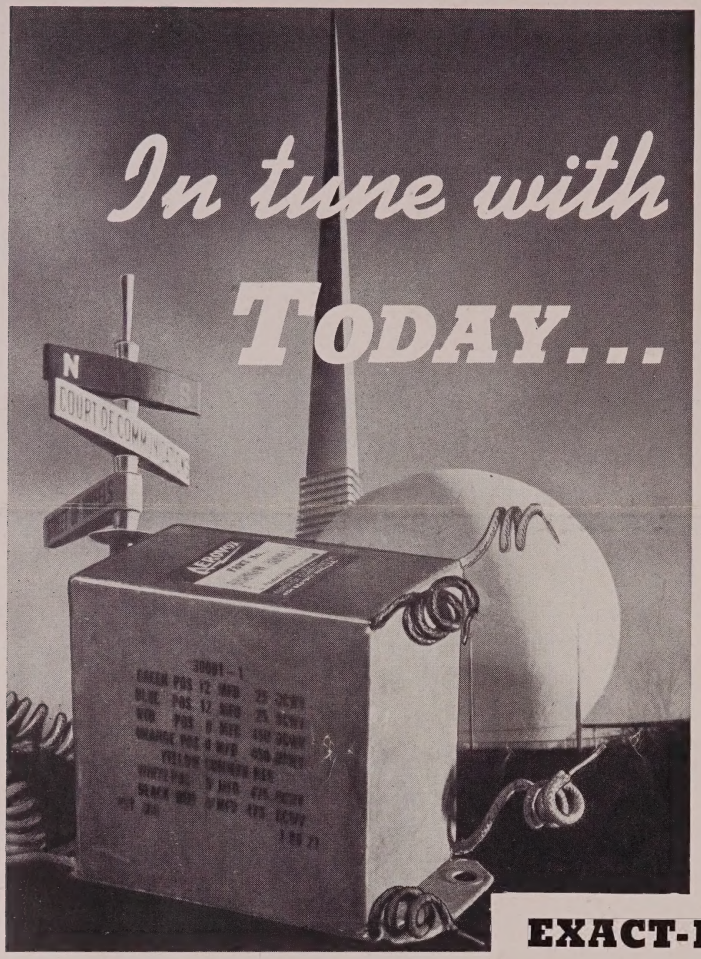
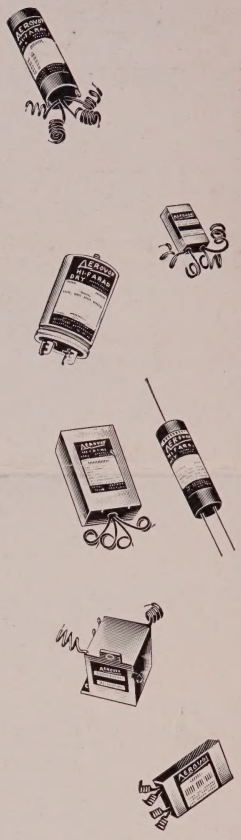


Figure 7





Insist on

EXACT DUPLICATES...

Your local AEROVOX jobber has the most up-to-date listing available for your use. You can immediately select and get that replacement which fits right, works right, looks right, for a stay-put, satisfactory, profitable job. Ask for latest catalog—or write us direct.

EXACT-DUPLICATE
Replacement Condensers

● For years, AEROVOX has pioneered the exact-duplicate idea, despite vigorous opposition. We built up the most extensive line covering all standard set needs, while others offered general-utility units for make-shift replacements. No production runs have been too small for us, even on the more special types. Listings, constantly expanded, have always been kept up to date. Truly a colossal, difficult, costly job. ● But now, in 1939, we enjoy our reward: Our judgment is fully vindicated; servicemen prefer exact duplicates; and the condenser industry at large accords us that sincerest flattery of following in our footsteps.

AEROVOX CORPORATION

New Bedford, Mass.

Sales Offices in All Principal Cities